

AMENDMENTS TO THE CLAIMS

Claim 1. (Currently Amended) An ink jet printhead comprising:

one or more ejection modules each including:

a silicon chip having a front surface and a top surface,

a plurality of heating elements arranged parallel to the top surface of the silicon chip,

~~a plurality of ejection nozzles~~;

a plurality of ejection cells for said nozzles located above the heating elements,

delivery channels ~~for the~~ to deliver ink ~~[[of]]~~ to the ejection cells,

a main distribution channel ~~extending~~ defined in the top surface of the silicon chip
orthogonally to the delivery channels, ~~and aligned~~ the main distribution channel extending along the front
surface of the silicon chip without interruptions, and

a nozzle layer integrated with the ~~relative~~ top surface of the silicon chip, the nozzle layer
including and in which the ejection nozzles located above the respective ejection cells, wherein the ejection
nozzles are made parallel and adjacent to the front of the module heating elements and the top surface of
the silicon chip;

a support for mounting the module or the modules and which defines a feeding duct for the ink, the
feeding duct being in fluid communication with the front surface of the silicon chip and the main distribution
channel;

a seal between the module or the modules and said support, the seal arranged to form a fluid seal
between the feeding duct of the support and the ejection cells of the module or of the modules; and

a plurality of ribs ~~located in the~~ extending between the delivery channels and the main distribution

channel ~~between one or more delivery channels~~, the ribs extending transversely ~~across~~ to the main distribution channel to form a further distribution channel orthogonal to the main distribution channel, ~~and~~ the ribs bearing against the nozzle layer;

wherein there is one pair of ribs for each delivery channel or one pair of ribs for a plurality of delivery channels.

Claim 2. (Currently Amended) Printhead according to claim 1, ~~characterized in that~~ wherein in said module or in each module, the ejection cells are positioned at 0.5-1.0 mm from said front surface.

Claim 3. (Currently Amended) Printhead according to claim 1, ~~characterized in that~~ wherein said distribution channel is defined by a surface etching in the relative silicon chip.

Claim 4. (Currently Amended) Printhead according to claim 1, wherein each chip defines a reference surface upon which are arranged said ejection cells, and the distribution channel of the module or of the modules is made in an area of a reference surface that includes said front surface; said seal includes a sealing lamina having an edge adjacent to the nozzles and mounted to provide fluid sealing between the nozzle layer and said support and to cover the feeding duct.

Claim 5. (Currently Amended) Printhead according to claim 1, ~~characterized in that~~ wherein said ribs are set adjacent to each delivery channel.

Claim 6. (Currently Amended) Printhead according to claim 1, ~~characterized in that~~ wherein said ribs are set adjacent to a plurality of delivery channels.

Claim 7. (Currently Amended) Printhead according to claim 1, ~~characterized in that~~ wherein the nozzle layer defines the ejection cells and the delivery channels, and is fastened to said ribs.

Claim 8. (Currently Amended) Printhead according to claim 4, ~~characterized in that~~ wherein the sealing lamina is limited by a tapering edge adjacent to said nozzles.

Claim 9. (Currently Amended) Printhead according to claim 1, ~~characterized in that~~ wherein the distribution channel is of width 0.3-1.0 mm and said ribs extend for a distance of 0.2-1.0 mm in said distribution channel.

Claim 10. (Currently Amended) Printhead according to claim 1, ~~characterized in that~~ wherein said ribs are of width 15-30 μm .

Claim 11. (Currently Amended) Printhead according to claim 1, wherein the cells and the delivery channels rest upon a given surface of said chip, ~~said head being characterized in that,~~ and in said module or in each module, the distribution channel is made on a surface of the chip opposite to said given surface, facing the feeding duct of the mounting support and wherein ducts or slots are provided, passing through said chip which provide fluid connection between the distribution channel on said opposite surface and the

delivery channels on said given surface.

Claim 12. (Currently Amended) Printhead according to claim 11, ~~characterized in that~~ wherein said nozzle layer acts as a fluid seal for said cells and for said channels with respect to said given surface of the chip.

Claim 13. (Currently Amended) Printhead according to claim 11, ~~characterized in that~~ wherein said distribution channel is adjacent to said front surface, has no bank and defines in the chip a projecting section of lesser thickness and in which said nozzle layer extends over said projecting section.

Claim 14. (Currently Amended) Printhead according to claim 11, ~~characterized in that~~ wherein said seal includes sealing material inserted between the nozzle layer and/or the chip and said support.

Claim 15. (Currently Amended) Printhead according to claim 1, ~~characterized in that~~ wherein said nozzle layer defines spaces above the substrate for a height of 10-25 μm in said cells and in said delivery channels.

Claim 16. (Currently Amended) Printhead according to claim 1, ~~characterized in that it may be used in a parallel or serial-parallel type printing device, the printhead further comprising and comprises a plurality of modules aligned along said front surface, wherein and in which~~ said support comprises a board of rigid material that defines said feeding duct through its thickness; and wherein ~~in which~~ said modules are

mounted side by side on said board and with the nozzles aligned parallel to the front surface.

Claim 17. (Currently Amended) Printhead according to claim 16, ~~characterized in that it includes~~ further comprising a frame mounted on said board beside said ejector modules having the upper surface adjacent to the upper surface of the nozzle layers of the modules.

Claim 18. (Currently Amended) Printhead according to claim 4, ~~characterized in that~~ wherein the upper surface of the frame is substantially flush with the upper surface of the nozzle layers and wherein said sealing lamina is mounted tight on the frame and on the nozzle layers of the modules, in correspondence with the ribs.

Claim 19. (Currently Amended) Printhead according to claim 11, ~~characterized in that~~ wherein said sealing material is arranged between said frame and the nozzle layer or the relative chip of the modules.

Claim 20. (Currently Amended) Process for manufacturing an ink jet printhead, comprising the steps of:

preparing ejector modules, each including:

a chip substrate ~~with a relative~~ having a front surface and a top surface,
having a plurality of resistors arranged parallel to the top surface of the chip substrate,
a plurality of ejection cells located above the resistors, and
delivery channels ~~for the~~ to deliver ink ~~[[of]]~~ to the ejection cells,

a main distribution channel, defined in the top surface of the silicon chip, the main distribution channel extending orthogonally to the delivery channels, and ~~parallel and adjacent to~~ along the front surface of the chip substrate without interruptions, and

a nozzle layer having ejection nozzles aligned above the resistors and adjacent to an edge of the module, said ejection nozzles being parallel and adjacent to the resistors and the top surface of the chip substrate ~~said front and arranged above the resistors and in which the head includes~~

providing a support having an ink feeding duct for one or more modules, the ink feeding duct being in fluid communication with the front surface of the silicon chip chip substrate and the main distribution channel;

~~wherein assembling the ink jet printhead comprises:~~

mounting the module or modules on said support so as to have the main distribution channel or channels in fluid communication with said feeding duct;

hydraulically sealing the nozzle layer of the module or of the modules from said support, for ink-tightness in feeding the ink between the feeding duct and the nozzles through said delivery channels;

making an etching on a given face of the chip substrate to produce said main distribution channel ~~between~~ extending along the front surface of the chip substrate without interruptions ~~and an area adjacent to the resistors and parallel to the front~~;

producing sacrificial volumes for defining the limits of the ejection cells above the resistors and the delivery channels above the area;

applying a structural layer over said sacrificial volumes to define said nozzle layer;

wherein said etching step produces on said face, in addition to the main distribution channel, a series of

ribs that extend transversely across the main distribution channel between the delivery channels and the main distribution channel to form a further distribution channel orthogonal to the main distribution channel and in fluid communication with both said delivery channels and said main distribution channel, and in which a part of the sacrificial volumes extend into the space between said ribs and on said main distribution channel,

further wherein a part of the structural layer is applied on the ribs and remains fastened on said ribs after removal of the sacrificial volumes.

Claim 21. (Previously Presented) Process according to claim 20, further comprising:

producing the ejection nozzles on said structural layer in correspondence with the sacrificial volumes of the cells.

Claim 22. (Cancelled)

Claim 23. (Currently Amended) Process according to claim 20, ~~characterized in that~~ wherein producing the sacrificial volumes comprises:

- (a) covering said distribution channel with sacrificial photoresist, flush with said data face of the chip;
- (b) planarizing the photoresist covering the channel and cleaning the parts adjacent to said distribution channel;
- (c) applying a layer of controlled thickness of sacrificial photoresist on said substrate above the resistors, the ribs and the photoresist covering the channel;

(d) exposing with a mask said layer of controlled thickness for defining said cells, the delivery channels and the distribution channel and delimiting said ribs; and

(e) developing said layer of controlled thickness constituting the sacrificial volumes for said cells, for the delivery channels and for the distribution channel and leaving zones for attachment of the chip beside said cells and the distribution channels and on said ribs.

Claim 24. (Currently Amended) Process according to claim 20, ~~characterized in that~~ wherein said longitudinal etching is made on the face of the chip, opposite the said given face, forming a projecting section delimited by said front and in which a slot forming step is provided, in which slots are produced in the thickness of the projecting sections and in correspondence with the delivery channels and in which, for assembling of the head, the modules are mounted on the bearing surface of the support with said slots in fluid connection with the feeding duct of the support.

Claim 25. (Currently Amended) Process for manufacturing a printhead according to claim 20, ~~characterized in that~~ wherein said support includes a board with a bearing surface for said chips and an upper surface adjacent to the feeding duct and a distance from said bearing surface and wherein said upper surface is defined by a frame or is obtained directly from the board, the sealing step including the insertion of a seal between the chip or the structural layer and said upper surface.

Claim 26. (Currently Amended) Process according to claim 25, ~~characterized in that~~ wherein said seal includes a sealing lamina glued between said upper surface and the structural layer, in contrast with said

ribs.

Claim 27. (Currently Amended) Process according to claim 24, ~~characterized in that~~ wherein said seal includes sealing material inserted between the fronts of the chips and said upper surface.

Claim 28. (Cancelled)